Claims

1. Ion implantation apparatus comprising:

an ion source for emitting ions generated from a source material;

a mass discriminating magnet for bending ions away from a trajectory along a path of ion travel downstream from the ion source;

a scanning electrode positioned to intercept ions subsequent to the mass discriminating magnet to scan ions from side to side in a controlled manner to form an ion beam having a width; and

a lens structure which defines a region into which the ions pass for deflecting ions away from an initial trajectory downstream from the scanning electrode as they enter the lens structure; said lens structure including first and second electrodes spaced apart along a direction of ion movement which extends on opposite sides of a beam path across a width of the ion beam for deflecting ions entering the lens structure; said lens structure including one electrode for accelerating ions and one electrode for decelerating said ions to cause ions entering the lens structure to exit said lens structure with approximately the same exit trajectory regardless of the trajectory ions enter the lens structure.

2. The Apparatus of claim 1 additionally comprising a power supply for applying a static voltage to each of the first and second electrodes.

3. The apparatus of claim 2 wherein the power supply supplies the same voltage to each electrode.

4. The apparatus of claim 1 wherein the first electrode comprises an entrance electrode for creating a first region of electric field for ions entering the lens structure and wherein the entrance electrode is concave as seen from a region of ions entering the lens and further wherein said second electrode comprises an exit electrode for creating a second region of electric field for ions that have passed through the entrance electrode and wherein the exit electrode is convex as seen from a region of bounded by the entrance electrode.

5. The apparatus of claim 1 wherein the first electrode comprises an entrance electrode for creating a first region of electric field for ions entering the lens structure and wherein the entrance electrode is convex as seen from a region of ions entering the lens and further wherein said second electrode comprises an exit electrode for creating a second region of electric field for ions that have passed through the entrance electrode and wherein the exit electrode is concave as seen from a region of bounded by the entrance electrode.

6. The apparatus of claim 1 wherein a first electrode encountered by ions moving along an ion beam path is an accelerating electrode and a second electrode encountered by the ions is a decelerating electrode.

7. The apparatus of claim 1 wherein a first electrode encountered by ions moving along an ion beam path is an decelerating electrode and a second electrode encountered by the ions is a accelerating electrode.

8. The apparatus of claim 1 wherein the first and second electrodes are positioned in relation to first and second fixed, lower potential electrodes spaced from the first electrode and the second electrode to create first and second electric field defining gaps through which the ions move.

9. For use with an ion implanter having ion beam that is deflected from side to side before treating a workpiece, a lens structure which defines a region into which the ions pass for deflecting ions away from an initial trajectory as they enter the lens structure; said lens structure including a first energized electrode and a second energized electrode spaced apart along a direction of ion movement which extends on opposite sides of a beam path across a width of the ion beam for deflecting ions entering the lens structure; wherein one of said first energized electrode and second energized electrode accelerates ions and wherein a different electrode of said first energized electrode and said second energized electrode decelerates said ions to cause ions entering the lens structure to exit

said lens structure with approximately the same exit trajectory regardless of the trajectory ions enter the lens structure.

10 The lens structure of claim 9 additionally comprising first and second reference electrodes maintained at a lower potential than the first energized and the second energized electrodes and spaced from the energized electrodes to create electric field defining gaps.

11. The lens structure of claim 9 comprising a power supply for energizing the first energized electrode and the second energized electrode to the same electric potential.

12. A process for forming an ion beam for use with an ion implantater comprising:

accelerating ions created away from a source material to create an ion beam;

scanning ions in said beam from side to side in a controlled manner to form a thin ion beam having a width; and

deflecting ions that make up the thin ion beam away from an initial trajectory as they enter a deflection region by positioning first and second energized electrodes in spaced apart relation along a direction of ion movement to form a lens and energizing the first and second energized electrodes thereby creating an electric field to deflect ions entering the deflection region; wherein a field created by one electrode of said first and second energized electrodes accelerates ions and a field created by one electrode of said first and second energized electrodes decelerates ions to cause ions entering the deflection region to exit said deflection region with approximately the same exit trajectory regardless of the initital trajectory the ions enter the deflection region.

13. The process of claim 12 wherein the first and second energized electrodes are curved in a direction across the width of the thin beam to create a non-uniform electric field across the width of said beam.

14. The process of claim 12 additionally comprising positioning first and second reference electrodes positioned in relation to each of said first and second energized

electrodes to create a gap for accelerating or decelerating ions as they move through the gap.

15. The process of claim 14 wherein the first and second energized electrodes are energized to the same static electric potential for creating accelerating and decelerating fields in said gaps.

16. The process of claim 14 wherein relative biasing between the first and second energized electrodes and the first and second reference electrodes is controlled so that ions experience first an acceleration and subsequently a deceleration in said gaps.

17. The process of claim 14 wherein relative biasing between the first and second energized electrodes and the first and second reference electrodes is controlled so that ions experience first a deceleration and subsequently an acceleration in said gaps.

18. The process of claim 12 additionally comprising placing additional energized electrodes along an ion beam path for accelerating and decelerating ions in the ion beam.

19. The process of claim 18 wherein each of the first, second and additional energized electrodes has an associated reference electrode which define an associated gap through which ions pass.

20. The process of claim 18 wherein the additional energized electrodes are configured similarly with respect to the ion beam to the first and second energized electrodes to provide a plurality of series configured lens sections and wherein energizing voltages coupled to the additional as well as the first and second energized electrodes are reduced from voltage levels needed for a single lens section having only said first and second energized electrodes.